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United States Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Braidwood Station, Units 1 and 2
Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and STN 50-457

Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: Request for a License Amendment to Revise the Fuel Centerline Temperature Safety Limit for Byron and Braidwood Stations

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company (EGC), LLC is requesting changes to Appendix A, Technical Specifications (TS) of Facility Operating License Nos. NPF-72, NPF-77, NPF-37 and NPF-66, for Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2, respectively. The proposed change will revise the Reactor Core Safety Limit (SL) for peak fuel centerline temperature from less than or equal to 4700°F (i.e., the current TS limit) to the design basis fuel centerline melt temperature of less than 5080°F, for unirradiated fuel, decreasing by 58°F per 10,000 Megawatt-Days per Metric Tonne Uranium (MWD/MTU) burnup.

During Byron Station, Unit 1 Cycle 10 (i.e., B1C10) operation, two Lead Test Assemblies (LTAs) consisting of low tin ZIRLO fuel cladding, fuel pin spring clips, and higher density fuel pellets were utilized consistent with TS 4.2.1, "Fuel Assemblies." For Byron Station, Unit 2 Cycle 10 (i.e., B2C10) operation, these LTAs were again utilized; however, one of the LTAs was modified to also include four fuel rods with a beginning of cycle burnup of approximately 45,750 MWD/MTU for the purpose of testing these rods under extended fuel burnup conditions up to approximately 69,000 MWD/MTU.

The current SL of 4700°F was selected as a conservative limit to ensure the fuel centerline melt temperature design basis was satisfied with no consideration given to fuel burnup conditions. At extended fuel burnup conditions, the current SL of 4700°F will become non-conservative with respect to the fuel centerline melt temperature design basis after a burnup of approximately 65,500 MWD/MTU. The analytical method used to determine the basis for fuel centerline temperature limits is discussed in Westinghouse Topical Report, WCAP 12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report." In addition, WCAP-14483-A, "Generic Methodology for Expanded Core Operating Limits Report," implements this fuel centerline

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temperature basis as the Safety Limit for the TS. Both WCAPs have been previously approved by the NRC.

In addition, although there are no TS which impose a limit on fuel rod burnup, Byron and Braidwood Stations have a licensing basis commitment that limits the fuel rod-average burnup to ≤ 60,000 MWD/MTU. This licensing basis commitment is documented in the NRC Safety Evaluation supporting Amendments 78 and 70 for Byron and Braidwood Stations respectively, dated December 19, 1995. These amendments approved the use of ZIRLO fuel cladding. Since the four high burnup fuel rods in B2C10 will exceed this licensing basis limit, NRC approval is also requested to increase the rod-average burnup limit for high burnup LTAs from 60,000 MWD/MTU to approximately 69,000 MWD/MTU for B2C10 and up to 75,000 MWD/MTU for future LTA campaigns. The acceptability of using the four high burnup rods in an LTA is evaluated in the B2C10 Reload Safety Evaluation which is supported by Westinghouse Topical Report, "Extended Burnup Operation Assessment for the VANTAGE+ Design in Byron Unit 2 Cycle 10," dated March 2001. The NRC has previously approved similar extended fuel burnup requests for North Anna, Units 1 and 2, in a letter from G. E. Edison (NRC) to J. P. O'Hanlon (Virginia Electric and Power Company), "North Anna Units 1 and 2, Re: Burnup in Lead Fuel Rods," dated September 8, 1999; and for Three Mile Island Nuclear Station, Unit 1, in a letter from T. G. Colburn (NRC) to M. E. Warner (AmerGen Energy Company, LLC), "Three Mile Island Nuclear Station, Unit 1 (TMI-1) - Re: Proposed Irradiation of Fuel Rods Beyond Current Lead Rod Burnup Limit," dated May 18, 2001.

This amendment request is subdivided as shown below.

1. Attachment A provides a description and safety analysis of the proposed changes.

2. Attachments B-1 and B-2 provide the marked up TS pages with the proposed change indicated for Braidwood Station and Byron Station. Attachments B-3 and B-4 provide the typed TS pages with the proposed change incorporated. There are no associated Bases pages with this proposed TS change.

3. Attachment C describes our evaluation performed using the criteria in 10 CFR 50.91(a), "Notice for public comment," paragraph (1), which provides information supporting a finding of no significant hazards consideration using the standards in 10 CFR 50.92, "Issuance of amendment," paragraph (c).

4. Attachment D provides information supporting an Environmental Assessment. We have determined that the proposed changes meet the criteria for a categorical exclusion set forth in paragraph (c)(10) of 10 CFR 51.22, "Criterion for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review."

These four high burnup fuel rods, currently in use at Byron Station, Unit 2, are projected to accrue a burnup of 60,000 MWD/MTU near the end of March 2002; therefore, we request that the NRC review and approve exceeding 60,000 MWD/MTU burnup for high burnup LTAs and the proposed TS change by March 15, 2002. Note that the four high burnup fuel rods are projected to accrue a burnup of 65,500 MWD/MTU near the end of July 2002, at which point the current SL of 4700°F will become non-conservative with respect to the fuel centerline melt temperature design basis as previously noted.

This proposed change has been reviewed and approved by the Braidwood Station and Byron Station Plant Operations Review Committees and Nuclear Safety Review Boards in accordance with the requirements of the Exelon Quality Assurance Program.

We are notifying the State of Illinois of this request for amendment by transmitting a copy of this letter and its attachments to the designated state official.

Should you have any questions regarding this submittal, please contact Mr. J. A. Bauer at (630) 657-2801.

Respectfully,

Terrence W. Simpkin

T. W. Simpkin
Manager – Licensing
Mid-West Regional Operating Group

Attachments: Attachment A, Description and Safety Analysis for Proposed Changes
Attachment B-1, Marked-up Pages For Proposed Changes, Braidwood Station
Attachment B-2, Marked-up Pages For Proposed Changes, Byron Station
Attachment B-3, Incorporated Proposed Changes, Typed Pages, Braidwood Station
Attachment B-4, Incorporated Proposed Changes, Typed Pages, Byron Station
Attachment C, Information Supporting a Finding of No Significant Hazards Consideration
Attachment D, Information Supporting an Environmental Assessment

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Braidwood Station
NRC Senior Resident Inspector – Byron Station
Office of Nuclear Facility Safety – Illinois Department of Nuclear Safety

STATE OF ILLINOIS	)	
COUNTY OF DUPAGE	)	
IN THE MATTER OF	)	
EXELON GENERATION COMPANY, LLC	)	**Docket Numbers**
BYRON STATION UNITS 1 AND 2	)	**STN 50-454 AND STN 50-455**
BRAIDWOOD STATION UNITS 1 AND 2	)	**STN 50-456 AND STN 50-457**

SUBJECT: Request for a License Amendment to Revise the Fuel Centerline Temperature Safety Limit for Byron and Braidwood Stations

AFFIDAVIT

I affirm that the content of this transmittal is true and correct to the best of my knowledge, information and belief.

T. W. Simpkin
Manager – Licensing

Subscribed and sworn to before me, a Notary Public in and for the State above named, this 21st day of September, 2001.

Notary Public

"OFFICIAL SEAL"
Timothy A. Byam
Notary Public, State of Illinois
My Commission Expires 11/24/2001

ATTACHMENT A

BYRON STATION, UNITS 1 AND 2
BRAIDWOOD STATION, UNITS 1 AND 2

DESCRIPTION AND SAFETY ANALYSIS FOR PROPOSED CHANGES

A. SUMMARY OF PROPOSED CHANGES

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company (EGC), LLC is requesting changes to Appendix A, Technical Specifications (TS) of Facility Operating License Nos. NPF-72, NPF-77, NPF-37 and NPF-66, for Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2, respectively. The proposed change will revise the Reactor Core Safety Limit (SL) for peak fuel centerline temperature from less than or equal to 4700°F (i.e., the current TS limit) to the design basis fuel centerline melt temperature of less than 5080°F, for unirradiated fuel, decreasing by 58°F per 10,000 Megawatt-Days per Metric Tonne Uranium (MWD/MTU) burnup.

During Byron Station, Unit 1 Cycle 10 operation, two Lead Test Assemblies (LTAs) consisting of low tin ZIRLO fuel cladding, fuel pin spring clips, and higher density fuel pellets were utilized consistent with TS 4.2.1, "Fuel Assemblies." For Byron Station, Unit 2 Cycle 10 operation, these LTAs were again utilized; however, one of the LTAs was modified to also include four fuel rods with a beginning of cycle burnup of approximately 45,750 MWD/MTU for the purpose of testing these rods under extended fuel burnup conditions up to approximately 69,000 MWD/MTU.

The current SL of 4700°F was selected as a conservative limit to ensure the fuel centerline melt temperature design basis was satisfied with no consideration given to fuel burnup conditions. At extended fuel burnup conditions, the current SL of 4700°F will become non-conservative with respect to the fuel centerline melt temperature design basis after a burnup of approximately 65,500 MWD/MTU. Therefore, the fuel centerline temperature SL needs to be modified consistent with the design basis fuel centerline melt temperature limit. The analytical method used to determine the basis for fuel centerline temperature limits is discussed in Westinghouse Topical Report, WCAP 12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," (i.e., Reference 1). In addition, WCAP-14483-A, "Generic Methodology for Expanded Core Operating Limits Report," (i.e., Reference 2), implements this fuel centerline temperature basis as the Safety Limit for the TS. Both WCAPs have been previously approved by the NRC.

In addition, although there are no TS which impose a limit on fuel rod burnup, Byron and Braidwood Stations have a licensing basis commitment that limits the current fuel rod-average burnup to $\leq$ 60,000 MWD/MTU. This licensing basis commitment is documented in the NRC Safety Evaluation supporting Amendments 78 and 70 for Byron and Braidwood Stations respectively, dated December 19, 1995. These amendments approved the use of ZIRLO fuel cladding. Since the four high burnup fuel rods will exceed this licensing basis limit, NRC approval is also requested to increase the rod-average burnup limit for high burnup LTAs from 60,000 MWD/MTU to approximately 69,000 MWD/MTU for Byron Station, Unit 2 Cycle 10, and up to 75,000 MWD/MTU for future LTA campaigns. The acceptability of using the four high burnup rods in an LTA is evaluated in the Byron Station, Unit 2 Cycle 10 Reload Safety Evaluation which is supported by Westinghouse Topical Report, "Extended Burnup Operation Assessment for the VANTAGE+ Design in Byron Unit 2 Cycle 10," dated March 2001. The NRC has previously approved similar extended fuel burnup requests for North Anna, Units 1 and 2, in a letter from G. E. Edison (NRC) to J. P. O'Hanlon (Virginia Electric and Power

Company), "North Anna Units 1 and 2, Re: Burnup in Lead Fuel Rods," dated September 8, 1999; and for Three Mile Island Nuclear Station, Unit 1, in a letter from T. G. Colburn (NRC) to M. E. Warner (AmerGen Energy Company, LLC), "Three Mile Island Nuclear Station, Unit 1 (TMI-1) - Re: Proposed Irradiation of Fuel Rods Beyond Current Lead Rod Burnup Limit," dated May 18, 2001.

The marked-up TS pages are provided in Attachments B-1 and B-2 for Braidwood Station and Byron Station, respectively. There are no associated Bases changes with this TS change.

B. DESCRIPTION OF THE CURRENT REQUIREMENTS

TS SL 2.1.1.3 currently states that "In MODES 1 and 2, the peak fuel centerline temperature shall be maintained ≤ 4700°F."

The current licensing basis for Byron and Braidwood Stations limits the current fuel rod-average burnup to ≤ 60,000 MWD/MTU. This licensing basis commitment is documented in the NRC Safety Evaluation supporting Amendments 78 and 70 for Byron and Braidwood Stations respectively, dated December 19, 1995. These amendments approved the use of ZIRLO fuel cladding.

C. BASES FOR THE CURRENT REQUIREMENTS

Peak Fuel Centerline Temperature Safety Limit

General Design Criteria (GDC) 10 requires that specified acceptable fuel design limits are not exceeded during steady state operation, normal operational transients, and Anticipated Operational Occurrences (AOOs). Therefore, Reactor Core SLs have been established to preclude violation of the following fuel design criteria:

a. There must be at least a 95% probability that the hot fuel pellet in the core must not experience centerline fuel melting; and

b. There must be at least a 95% probability at a 95% confidence level that the hot fuel rod in the core does not experience Departure from Nucleate Boiling (DNB), (i.e., the 95/95 DNB criterion).

The restrictions of this SL prevent overheating of the fuel and cladding, as well as possible cladding perforation, that would result in the release of fission products to the reactor coolant. Overheating of the fuel is prevented by maintaining the steady state peak Linear Heat Rate (LHR) below the level at which fuel centerline melting occurs. Overheating of the cladding is prevented by restricting fuel operation to within the nucleate boiling regime where the heat transfer coefficient is large and the cladding surface temperature is slightly above the coolant saturation temperature. Fuel centerline melting occurs when the LHR, or power peaking, in a

region of fuel is high enough to cause the fuel centerline temperature to reach the melting point of the fuel.

The Reactor Core SLs are used to define the various Reactor Protection System (RPS) functions such that criteria for steady state operation, normal operational transients, and AOOs are satisfied.

The current licensing bases for the Reactor Core SLs and the RPS functions were approved in the NRC Safety Evaluation issued in a letter from the NRC, "Byron and Braidwood – Issuance of Amendments Regarding Relocation of Reactor Coolant System Limits (TAC Nos. MA7809, MA7810, MA7807, and MA7808)," dated May 15, 2000, (i.e., Amendments 106 and 113 for Braidwood Station and Byron Station, respectively). The specific requirements regarding the safety limits (i.e., fuel DNB design basis and the fuel centerline melt design basis) are supported by WCAP-14483-A. WCAP-14483-A specifies that the fuel centerline temperature limit is based on the melting temperature for Uranium Dioxide (i.e., UO_2) of 5080°F, for unirradiated fuel, decreasing by 58°F per 10,000 MWD/MTU of burnup. For design purposes, the fuel centerline temperature limit was selected as 4700°F and is significantly below the calculated melting temperature to allow for fuel temperature calculation and other uncertainties.

Fuel Rod Burnup Licensing Basis Limit

There are no TS which impose a limit on fuel rod burnup; however, Byron and Braidwood Stations have a licensing basis commitment that limits the current fuel rod-average burnup to $\leq$ 60,000 MWD/MTU. This licensing basis commitment is documented in the NRC Safety Evaluation supporting Amendments 78 and 70 for Byron and Braidwood Stations respectively, dated December 19, 1995. These amendments approved the use of ZIRLO fuel cladding.

The basis for approval of ZIRLO cladding was based on an NRC Safety Evaluation addressed to Westinghouse, "Acceptance for Referencing of Topical Report WCAP-12610, 'VANTAGE+ Fuel Assembly Reference Core Report,'" dated July 1, 1991. This Safety Evaluation approved the use of the VANTAGE+ fuel design, i.e., ZIRLO clad fuel, described in WCAP-12610-P-A and found it acceptable up to a rod-average burnup of 60,000 MWD/MTU. The Safety Evaluation notes that WCAP-12610-P-A supports the following conclusions.

1. The mechanical design bases and limits for the ZIRLO clad fuel assembly design are the same as those for the previously licensed Zircaloy-4 clad fuel assembly design, except those for clad corrosion.

2. The neutronic evaluations have shown that the ZIRLO clad fuel nuclear design bases are satisfied and that key safety parameter limits are applicable. The nuclear design models and methods accurately describe the behavior of ZIRLO clad fuel.

3. The thermal and hydraulic design basis for the ZIRLO clad fuel is unchanged.

4. The methods and computer codes used in the analysis of the non-loss of coolant accident (LOCA) licensing basis events are valid for ZIRLO clad fuel and all licensing basis criteria will be met.

5. The large break LOCA evaluation model was modified to reflect the behavior of the ZIRLO clad material during a LOCA. It is concluded that the revised evaluation model satisfies the requirements of 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," and 10 CFR 50, Appendix K, "ECCS Evaluation Models." There is no significant impact on typical large break LOCA analysis results for the ZIRLO model revision.

D. NEED FOR REVISION OF THE REQUIREMENTS

During Byron Station, Unit 1 Cycle 10 operation, two LTAs consisting of low tin ZIRLO fuel cladding, fuel pin spring clips, and higher density fuel pellets were utilized consistent with TS 4.2.1, "Fuel Assemblies." For Byron Station, Unit 2 Cycle 10 operation, these LTAs were again utilized; however, one of the LTAs (i.e., assembly M09E) was modified to also include four fuel rods with a beginning of cycle burnup of approximately 45,750 MWD/MTU to confirm the use of the ZIRLO alloy at extended discharge burnup levels exceeding 60,000 MWD/MTU, which is the current licensing basis maximum burnup for the VANTAGE+ fuel design (i.e., ZIRLO clad fuel). The anticipated rod-average burnup for the four high burnup rods will be approximately 69,000 MWD/MTU; therefore, NRC approval is requested to increase the rod-average burnup limit for high burnup LTAs from 60,000 MWD/MTU to approximately 69,000 MWD/MTU for Byron Station, Unit 2 Cycle 10, and up to 75,000 MWD/MTU for future LTA campaigns.

The current SL for fuel centerline temperature of 4700°F was selected as a conservative limit to ensure the fuel centerline melt design basis was satisfied with no dependence on accrued fuel burnup. At the anticipated end-of-cycle burnup of approximately 69,000 MWD/MTU for these rods, the calculated fuel centerline melt design basis temperature (i.e., assuming 5080°F for unirradiated fuel, decreasing by 58°F per 10,000 MWD/MTU) would be approximately 4680°F. At extended fuel burnup conditions, the current SL of 4700°F would be non-conservative with respect to the fuel centerline melt temperature design basis after a burnup of approximately 65,500 MWD/MTU. Therefore, the fuel centerline temperature SL needs to be modified consistent with the design basis fuel centerline melt temperature limit.

E. DESCRIPTION OF THE PROPOSED CHANGES

The proposed change will revise Reactor Core SL 2.1.1.3 regarding fuel centerline temperature for Units 1 and 2 at Braidwood Station and Units 1 and 2 at Byron Station. SL 2.1.1.3 currently states:

> "In MODES 1 and 2, the peak fuel centerline temperature shall be maintained ≤ 4700°F."

This SL will be revised to state:

> "In MODES 1 and 2, the peak fuel centerline temperature shall be maintained < 5080°F, decreasing by 58°F per 10,000 MWD/MTU of burnup."

The proposed change is consistent with the fuel centerline melt temperature design basis described in WCAP-12610-P-A and the SLs specified in WCAP-14483-A. As previously noted, these WCAPs were approved by the NRC.

NRC approval is also requested to increase the rod-average burnup limit for high burnup LTAs from 60,000 MWD/MTU to approximately 69,000 MWD/MTU for Byron Station, Unit 2 Cycle 10, and up to 75,000 MWD/MTU for future LTA campaigns.

F. SAFETY ANALYSIS OF THE PROPOSED CHANGES

Peak Fuel Centerline Temperature Safety Limit

WCAP-14483-A is an NRC approved methodology which allows licensees the flexibility to enhance plant operating margin and/or core design margins without the need for cycle-specific license amendments. One of the approved changes was to replace the TS Reactor Core SLs Figure with more specific requirements regarding the SLs (i.e., the fuel DNB design basis and the fuel centerline melting temperature design basis).

As stated in WCAP-12610-P-A, the temperature of the VANTAGE+ fuel pellets is evaluated by the same methods that are used for all Westinghouse fuel designs. The fuel rod design analysis computer code (i.e., PAD) is an NRC-approved methodology. This analysis code determines the local power density associated with the peak fuel centerline temperature and ensures that adequate margin to fuel melt is maintained at all times in core life. Rod geometries, thermal properties, heat fluxes, and temperature differences are modeled to calculate the temperature at the surface and centerline of the fuel pellets. Fuel centerline temperatures are calculated as a function of local power and rod burnup.

WCAP-12610-P-A was approved up to a rod-average burnup of 60,000 MWD/MTU. As noted in this WCAP, the fuel centerline temperature limit is based on the melting temperature for UO_2 in the unirradiated condition, (i.e., 5080°F), decreasing by 58°F per 10,000 MWD/MTU of burnup. This fuel melt correlation was established by analysis documented in Christensen, J. A., et. al., "Melting Point of Irradiated Uranium Dioxide," Transactions of the American Nuclear Society, Volume 7, No. 4, 1964. This analysis documented two sets of data. The first set of data shows a linear relationship between fuel melt temperature and fuel burnup (i.e., fuel melt temperature decreases as burnup increases) between approximately 5000 MWD/MTU and 70,000 MWD/MTU; with a small increase in the rate of change of fuel melt temperature thereafter, up to approximately 95,000 MWD/MTU. The second set of data describes a more conservative relationship (i.e., a similar linear correlation but with lower fuel melt temperatures) that has become the industry accepted correlation. This correlation is the fuel melt design basis

described and approved in WCAP-12610-P-A, (i.e., the melting temperature for UO_2 in the unirradiated condition is 5080°F, decreasing by 58°F per 10,000 MWD/MTU of burnup). Based on the above discussion, it is reasonable and conservative to extrapolate and apply the WCAP-12610-P-A correlation to higher burnup regimes ≥ 60,000 MWD/MTU. Note that at a burnup of ≥ 65,500 MWD/MTU, this correlation is more conservative than the current SL of 4700°F.

To preclude fuel melting, the peak local power experienced during Condition I events, "Normal Operation and Operational Transients," and Condition II events, "Faults of Moderate Frequency," will be limited to a maximum value which is sufficient to ensure that the fuel centerline temperatures remain below the melting temperature at all burnups. Uncertainties are accounted for in the cycle specific analysis for fuel rod design. Sufficient margin, with respect to fuel melt design temperature, exists to account for fuel fabrication, plant conditions, core model and measurement uncertainties

The basis for the Overtemperature ΔT and Overpower ΔT reactor trip setpoints is specified in WCAP-14483-A. The Overtemperature ΔT and Overpower ΔT reactor trip functions will continue to provide their respective RPS functions such that criteria for steady state operation, normal operational transients, and AOOs are satisfied. None of the input parameters for these reactor trip functions are impacted by the proposed fuel centerline temperature change. Therefore, the Overtemperature ΔT and Overpower ΔT reactor trip functions will continue to ensure that during any Condition I or II transient, there will be at least a 95% probability at a 95% confidence level that the peak local power linear heat rate for fuel rods will not exceed the UO_2 melting temperature.

Fuel Rod Burnup Licensing Basis Limit

The anticipated rod-average burnup for the four high burnup rods at the end of Byron Station, Unit 2 Cycle 10 will be approximately 69,000 MWD/MTU. This burnup will exceed the current licensing basis limit of 60,000 MWD/MTU for fuel rod-average burnup; therefore, we are requesting NRC approval to increase the rod-average burnup limit for high burnup LTAs from 60,000 MWD/MTU to approximately 69,000 MWD/MTU for Byron Station, Unit 2 Cycle 10, and up to 75,000 MWD/MTU for future LTA campaigns. Fuel rod design criteria that become more limiting for high burnup fuel rods include fuel rod growth, clad fatigue, rod internal pressure and cladding corrosion. Evaluations have been performed using NRC-approved fuel rod design methodologies. These models have been used to perform similar evaluations for other high burnup LTAs. In addition, a developmental corrosion model for ZIRLO was used as an evaluation tool based primarily on data from high burnup fuel irradiated at the V. C. Summer and North Anna plants. Both the ZIRLO developmental corrosion model and the NRC-approved model have confirmed that the fuel rod design limits have been met.

The high burnup fuel rods will continue to satisfy the Specified Acceptable Fuel Design Limits (SAFDLs) specified in the Westinghouse Topical Report, WCAP-12488-A, "Westinghouse Fuel Criteria Evaluation Process," (i.e., Reference 3). This report was approved by the NRC on July 27, 1994. The clad integrity of the four high burnup rods in the LTA will be maintained as the LTAs will be placed in non-limiting core locations as permitted by TS 4.2.1 and will continue

to meet the safety parameter requirements. In addition, the acceptability of using the four high burnup rods in an LTA is evaluated in the Byron Station, Unit 2 Cycle 10 Reload Safety Evaluation which is supported by Westinghouse Topical Report, "Extended Burnup Operation Assessment for the VANTAGE+ Design in Byron Unit 2 Cycle 10," dated March 2001.

It has been shown in WCAP-12610-P-A, that even though there are variations in core inventories of isotopes due to extended burnup up to 75,000 MWD/MTU, there are no significant increases of isotopes that are major contributors to accident doses. It is worthy to note that, at higher burnups, there is actually a reduction in certain isotopes that are major dose contributors under accident situations (e.g., Kr-88). With only four high burnup rods in the entire core, any variation of isotopes will be extremely small. Thus, the radiation dose limitations of 10 CFR 100, "Reactor Site Criteria," will not be exceeded.

Westinghouse calculated the fuel centerline temperatures for uprated power conditions at Braidwood and Byron Stations with ZIRLO clad fuel and compared the results to the fuel centerline melt temperature design basis. Given that fuel temperatures decrease with time (i.e., burnup), assuming a constant linear heat rate, the most limiting time for fuel centerline temperatures is at the fuel's Beginning of Life (BOL). Analysis results indicate that the calculated fuel centerline temperatures for ZIRLO clad fuel at Braidwood and Byron Stations would remain sufficiently below the fuel centerline melt temperature for burnups up through 75,000 MWD/MTU. The Westinghouse calculation is conservative in that it assumes a bounding case with a constant 22.39 kw/ft local power linear heat rate from BOL through End of Life (EOL) conditions.

Fuel Assembly Characterization

As previously noted, during Byron Station, Unit 1 Cycle 10 operation, two LTAs consisting of low tin ZIRLO fuel cladding, fuel pin spring clips, and higher density fuel pellets were utilized consistent with TS 4.2.1, "Fuel Assemblies." For Byron Station, Unit 2 Cycle 10 operation, these LTAs were again utilized; however, one of the LTAs (i.e., assembly M09E) was modified to also include high burnup fuel rods. Four rods from LTA M09E were removed and replaced by previously burned rods from assembly L41E for the purpose of obtaining representative data at extended fuel burnup (i.e., > 60,000 MWD/MTU).

The top nozzle for M09E was replaced with a new removable top nozzle. The LTA is identical in shape and appearance to the current fuel assembly design. Assembly M09E is a once-burned fuel assembly incorporating Westinghouse 17x17 VANTAGE+ features in addition to the original LTA features (i.e., spring clip, low tin ZIRLO cladding, and higher density fuel pellets). Assembly M09E has ZIRLO guide thimbles and mixing vane mid-grids, a removable top nozzle, and a debris resistant bottom nozzle. The operation of assembly M09E, with the four high burnup regular ZIRLO clad fuel rods, is intended to confirm the acceptable use of the ZIRLO alloy to a discharge burnup level exceeding the current licensing basis.

LTA M09E originally operated in the Byron Station, Unit 1 Cycle 10 core for one cycle. It accrued an assembly burnup of approximately 25,964 MWD/MTU. The four high burnup donor

fuel rods were "twice-burned" (i.e., used for two fuel cycles) in assembly L41E and had rod-average burnups of approximately 45,750 MWD/MTU at the start of Byron Station, Unit 2 Cycle 10. The anticipated rod-average burnup for the four high burnup rods at the end of Byron Station, Unit 2 Cycle 10 will be approximately 69,000 MWD/MTU.

Post-Irradiation Examinations (PIE) were previously performed on LTA M09E and the four donor rods to characterize the assembly and rods prior to high burnup exposure. The peak crud-free oxide values for the four high burnup donor rods ranged from 38.6 to 49.6 microns, over a rod-average burnup range of approximately 45,043 MWD/MTU to 46,310 MWD/MTU. Single rod oxide examinations were also performed on eight of the original M09E LTA fuel rods. The peak crud-free oxide values for rods with regular ZIRLO cladding ranged from 14.3 to 16.3 microns, over a rod-average burnup range of approximately 26,635 MWD/MTU to 28,037 MWD/MTU. The peak crud-free oxide values for rods with low tin ZIRLO cladding ranged from 5.8 to 10.3 microns, over a rod-average burnup range of approximately 22,256 MWD/MTU to 27,254 MWD/MTU.

Other PIE examinations performed included assembly length, assembly bow, crud scraping, profilometry, and gamma scan measurements. Additional inspections were performed on the donor assembly and four other assemblies from that fuel region (i.e., assemblies L56F, L62F, L63F, L65F). These inspections included grid growth, grid oxide, guide thimble oxide, grid vane removal, and grid cell size. These inspections have been completed and the results are available for review. Future poolside PIE examinations will also be performed on the LTA assemblies and individual rods following each cycle of operation. Furthermore, hot cell examinations will be performed upon permanent discharge of the LTA assemblies, which is estimated to occur during the summer of 2005.

LOCA and Non-LOCA Analyses

Neither LTA will lead the core with respect to core operating limits in accordance with TS 4.2.1, which requires that LTAs be placed in nonlimiting core regions. Cycle-specific reload safety evaluations were performed for Byron Station, Unit 2 Cycle 10. These evaluations considered the effects of the LTAs including the high burnup rods.

Fuel rod design calculations, performed by Westinghouse, predicted the maximum $F_{\Delta H}$ for the LTA from the first cycle of operation to be 1.537 assuming appropriate uncertainties. For Byron Station, Unit 2 Cycle 10 operation, rod power in the LTA fuel is even lower than 1.537 due to the assembly fuel rods being once burned and the four high burnup rods being twice burned. Therefore, the expected $F_{\Delta H}$ will be below the 1.7 $F_{\Delta H}$ limit for the Byron Station, Unit 2 Cycle 10 core. Combining the $F_{\Delta H}$ margin with the once burned properties of the LTA, the LOCA analysis concluded the LTAs were acceptable for Byron Station, Unit 2 Cycle 10 without any Peak Clad Temperature (PCT) penalty.

For evaluation of the LTAs in the Byron Station, Unit 2 Cycle 10 core, fuel temperatures and pressures for the entire core were input into the LOCA and non-LOCA analyses. The high burnup LTA was bounded by these fuel temperatures and pressures. The temperatures and

pressures were extended up to 62,000 MWD/MTU burnup. Westinghouse evaluations demonstrated that fuel centerline temperatures decrease uniformly from 60,000 to 75,000 MWD/MTU, thus fuel average temperatures would also decrease. For the four high burnup rods, the 62,000 MWD/MTU temperatures were conservatively used up to 75,000 MWD/MTU burnup for evaluation purposes. These temperatures are bounded by the BOL temperatures.

Evaluations indicated that the linear heat rate value at the onset of fuel melting, for burnups up to 75,000 MWD/MTU, was 22.39 kw/ft. The Reload Safety Evaluation for Byron Station, Unit 2 Cycle 10 fuel, indicated that the most limiting peak linear heat rate for all fuel was 22.16 kw/ft; thus the linear heat rate limit of 22.39 kw/ft was satisfied.

Potential Future LTA Burnup Limits

Should high burnup LTAs be utilized in the Byron Station and/or Braidwood Station units in the future, analyses and fuel characterization inspections, similar to the Byron Station, Unit 2 Cycle 10, analyses described above, will be performed. In addition, cycle-specific Reload Safety Evaluations will be performed and will verify that all fuel design parameters and safety margins are maintained. Therefore, based on acceptable cycle-specific Reload Safety Evaluations and inspection results, it is acceptable to increase the current rod-average burnup limit of 60,000 MWD/MTU to approximately 69,000 MWD/MTU for high burnup LTAs in Byron Station, Unit 2 Cycle 10, and up to 75,000 MWD/MTU for future LTA campaigns.

G. IMPACT ON PREVIOUS SUBMITTALS

No other license amendment requests currently under review by the NRC are impacted by the information presented in this license amendment request.

H. SCHEDULE REQUIREMENTS

The four high burnup fuel rods, currently in use at Byron Station, Unit 2, are projected to accrue a burnup of 60,000 MWD/MTU near the end of March 2002; therefore, we request that the NRC review and approve exceeding 60,000 MWD/MTU burnup for high burnup LTAs, and the proposed TS change by March 15, 2002. Note that the four high burnup fuel rods are projected to accrue a burnup of 65,500 MWD/MTU near the end of July 2002, at which point the current SL of 4700°F will become non-conservative with respect to the fuel centerline melt temperature design basis as previously noted.

ATTACHMENT A

BYRON STATION, UNITS 1 AND 2
BRAIDWOOD STATION, UNITS 1 AND 2

DESCRIPTION AND SAFETY ANALYSIS FOR PROPOSED CHANGES

I. REFERENCES

1. WCAP-14483-A, "Generic Methodology for Expanded Core Operating Limits Report," Westinghouse Electric Corporation, approved January 19, 1999.

2. WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," Westinghouse Electric Corporation, approved April 1995.

3. WCAP-12488-A, "Westinghouse Fuel Criteria Evaluation Process," Westinghouse Electric Company, approved July 27, 1994.

ATTACHMENT B-1

MARKED-UP PAGES FOR PROPOSED CHANGES

BRAIDWOOD STATION

REVISED TS PAGES

2.0-1

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

In MODES 1 and 2, the combination of THERMAL POWER, Reactor Coolant System (RCS) highest loop average temperature, and pressurizer pressure shall not exceed the limits specified in the COLR; and the following SLs shall not be exceeded.

2.1.1.1 In MODE 1, the Departure from Nucleate Boiling Ratio (DNBR) shall be maintained ≥ 1.24 for the WRB-2 DNB correlation for a thimble cell and ≥ 1.25 for the WRB-2 DNB correlation for a typical cell.

2.1.1.2 In MODE 2, the DNBR shall be maintained ≥ 1.17 for the WRB-2 DNB correlation, and ≥ 1.30 for the W-3 DNB correlation.

2.1.1.3 In MODES 1 and 2, the peak fuel centerline temperature shall be maintained ~~≤ 4700°F.~~ < 5080°F, decreasing by 58°F per 10,000 MWD/MTU burnup.

2.1.2 RCS Pressure SL

In MODES 1, 2, 3, 4, and 5, the RCS pressure shall be maintained ≤ 2735 psig.

2.2 SL Violations

2.2.1 If SL 2.1.1 is violated, restore compliance and be in MODE 3 within 1 hour.

2.2.2 If SL 2.1.2 is violated:

2.2.2.1 In MODE 1 or 2, restore compliance and be in MODE 3 within 1 hour.

2.2.2.2 In MODE 3, 4, or 5, restore compliance within 5 minutes.

ATTACHMENT B-2

MARKED-UP PAGES FOR PROPOSED CHANGES

BYRON STATION

REVISED TS PAGES

2.0-1

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

In MODES 1 and 2, the combination of THERMAL POWER, Reactor Coolant System (RCS) highest loop average temperature, and pressurizer pressure shall not exceed the limits specified in the COLR; and the following SLs shall not be exceeded.

2.1.1.1 In MODE 1, the Departure from Nucleate Boiling Ratio (DNBR) shall be maintained ≥ 1.24 for the WRB-2 DNB correlation for a thimble cell and ≥ 1.25 for the WRB-2 DNB correlation for a typical cell.

2.1.1.2 In MODE 2, the DNBR shall be maintained ≥ 1.17 for the WRB-2 DNB correlation, and ≥ 1.30 for the W-3 DNB correlation.

2.1.1.3 In MODES 1 and 2, the peak fuel centerline temperature shall be maintained ~~≤ 4700°F.~~ < 5080°F, decreasing by 58°F per 10,000 MWD/MTU burnup.

2.1.2 RCS Pressure SL

In MODES 1, 2, 3, 4, and 5, the RCS pressure shall be maintained ≤ 2735 psig.

2.2 SL Violations

2.2.1 If SL 2.1.1 is violated, restore compliance and be in MODE 3 within 1 hour.

2.2.2 If SL 2.1.2 is violated:

2.2.2.1 In MODE 1 or 2, restore compliance and be in MODE 3 within 1 hour.

2.2.2.2 In MODE 3, 4, or 5, restore compliance within 5 minutes.

ATTACHMENT B-3

INCORPORATED PROPOSED CHANGES
TYPED PAGES

BRAIDWOOD STATION

REVISED TS PAGES

2.0-1

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

In MODES 1 and 2, the combination of THERMAL POWER, Reactor Coolant System (RCS) highest loop average temperature, and pressurizer pressure shall not exceed the limits specified in the COLR; and the following SLs shall not be exceeded.

2.1.1.1 In MODE 1, the Departure from Nucleate Boiling Ratio (DNBR) shall be maintained ≥ 1.24 for the WRB-2 DNB correlation for a thimble cell and ≥ 1.25 for the WRB-2 DNB correlation for a typical cell.

2.1.1.2 In MODE 2, the DNBR shall be maintained ≥ 1.17 for the WRB-2 DNB correlation, and ≥ 1.30 for the W-3 DNB correlation.

2.1.1.3 In MODES 1 and 2, the peak fuel centerline temperature shall be maintained < 5080°F, decreasing by 58°F per 10,000 MWD/MTU burnup.

2.1.2 RCS Pressure SL

In MODES 1, 2, 3, 4, and 5, the RCS pressure shall be maintained ≤ 2735 psig.

2.2 SL Violations

2.2.1 If SL 2.1.1 is violated, restore compliance and be in MODE 3 within 1 hour.

2.2.2 If SL 2.1.2 is violated:

2.2.2.1 In MODE 1 or 2, restore compliance and be in MODE 3 within 1 hour.

2.2.2.2 In MODE 3, 4, or 5, restore compliance within 5 minutes.

ATTACHMENT B-4

INCORPORATED PROPOSED CHANGES
TYPED PAGES

BYRON STATION

REVISED TS PAGES

2.0-1

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

In MODES 1 and 2, the combination of THERMAL POWER, Reactor Coolant System (RCS) highest loop average temperature, and pressurizer pressure shall not exceed the limits specified in the COLR; and the following SLs shall not be exceeded.

2.1.1.1 In MODE 1, the Departure from Nucleate Boiling Ratio (DNBR) shall be maintained ≥ 1.24 for the WRB-2 DNB correlation for a thimble cell and ≥ 1.25 for the WRB-2 DNB correlation for a typical cell.

2.1.1.2 In MODE 2, the DNBR shall be maintained ≥ 1.17 for the WRB-2 DNB correlation, and ≥ 1.30 for the W-3 DNB correlation.

2.1.1.3 In MODES 1 and 2, the peak fuel centerline temperature shall be maintained < 5080°F, decreasing by 58°F per 10,000 MWD/MTU burnup.

2.1.2 RCS Pressure SL

In MODES 1, 2, 3, 4, and 5, the RCS pressure shall be maintained ≤ 2735 psig.

2.2 SL Violations

2.2.1 If SL 2.1.1 is violated, restore compliance and be in MODE 3 within 1 hour.

2.2.2 If SL 2.1.2 is violated:

2.2.2.1 In MODE 1 or 2, restore compliance and be in MODE 3 within 1 hour.

2.2.2.2 In MODE 3, 4, or 5, restore compliance within 5 minutes.

ATTACHMENT C

INFORMATION SUPPORTING A FINDING OF NO SIGNIFICANT HAZARDS CONSIDERATION

According to 10 CFR 50.92, "Issuance of amendment," paragraph (c), a proposed amendment to an operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not:

> Involve a significant increase in the probability or consequences of an accident previously evaluated; or
>
> Create the possibility of a new or different kind of accident from any accident previously evaluated; or
>
> Involve a significant reduction in a margin of safety.

In support of this determination, an evaluation of each of the three criteria set forth in 10 CFR 50.92 is provided below regarding the proposed license amendment.

Overview

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company (EGC), LLC is requesting changes to Appendix A, Technical Specifications (TS) of Facility Operating License Nos. NPF-72, NPF-77, NPF-37 and NPF-66, for Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2, respectively. The proposed change will revise the Reactor Core Safety Limit (SL) for peak fuel centerline temperature from less than or equal to 4700°F (i.e., the current TS limit) to the design basis fuel centerline melt temperature of less than 5080°F, for unirradiated fuel, decreasing by 58°F per 10,000 Megawatt-Days per Metric Tonne Uranium (MWD/MTU) burnup.

During Byron Station, Unit 1 Cycle 10 operation, two Lead Test Assemblies (LTAs) consisting of low tin ZIRLO fuel cladding, fuel pin spring clips, and higher density fuel pellets were utilized consistent with Technical Specification 4.2.1, "Fuel Assemblies." For Byron Station, Unit 2 Cycle 10 operation, these LTAs were again utilized; however, one of the LTAs was modified to also include four fuel rods with a beginning of cycle burnup of approximately 45,750 MWD/MTU for the purpose of testing these rods under extended fuel burnup conditions up to approximately 69,000 MWD/MTU.

The current SL of 4700°F was selected as a conservative limit to ensure the fuel centerline melt temperature design basis was satisfied with no consideration given to fuel burnup conditions. At extended fuel burnup conditions, the current SL of 4700°F will become non-conservative with respect to the fuel centerline melt temperature design basis after a burnup of approximately 65,500 MWD/MTU. Therefore, the fuel centerline temperature SL is requested to be modified consistent with the design basis fuel centerline melt temperature limit.

In addition, although there are no TS which impose a limit on fuel rod burnup, Byron and Braidwood Stations have a licensing basis commitment that limits the fuel rod-average burnup to $\leq$ 60,000 MWD/MTU. This licensing basis commitment is documented in the NRC Safety Evaluation supporting Amendments 78 and 70 for Byron and Braidwood Stations respectively, dated December 19, 1995. These amendments approved the use of ZIRLO fuel cladding. Since the four high burnup fuel rods will exceed this licensing basis limit, NRC approval is also

requested to increase the current rod-average burnup limit of 60,000 MWD/MTU to approximately 69,000 MWD/MTU for Byron Station, Unit 2 Cycle 10, and up to 75,000 MWD/MTU for future LTA campaigns.

The proposed TS changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

The use of high burnup rods or assemblies will not increase the probability of any accident previously evaluated. These high burnup rods or assemblies will continue to satisfy all fuel mechanical, nuclear, thermal-hydraulic, and transient analysis design criteria.

Fuel type is not directly related to the probability of any previously evaluated accidents; however, adhering to applicable design criteria and standards precludes challenges to components and systems that could increase the probability of an accident. The high burnup fuel rods will continue to satisfy the Specified Acceptable Fuel Design Limits (SAFDLs) specified in the Westinghouse Topical Report, WCAP-12488-A, "Westinghouse Fuel Criteria Evaluation Process," which was approved by the NRC on July 27, 1994. The clad integrity of the four high burnup rods in the LTA will be maintained as the LTAs will be placed in non-limiting core locations as permitted by TS 4.2.1 and will continue to meet the safety parameter requirements. In addition, the acceptability of using the four high burnup rods in an LTA is evaluated in the Byron Station, Unit 2 Cycle 10 Reload Safety Evaluation which is supported by Westinghouse Topical Report, "Extended Burnup Operation Assessment for the VANTAGE+ Design in Byron Unit 2 Cycle 10," dated March 2001.

It has been shown in Westinghouse Topical Report, WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," approved by the NRC in April 1995, that even though there are variations in core inventories of isotopes due to extended burnup up to 75,000 MWD/MTU, there are no significant increases of isotopes that are major contributors to accident doses. It is worthy to note that, at higher burnups, there is a reduction in certain isotopes that are major dose contributors under accident situations (e.g., Kr-88). With only four high burnup rods in the entire core, any variation of isotopes will be extremely small. Thus, the radiation dose limitations of 10 CFR 100, "Reactor Site Criteria," will not be exceeded.

The bases for establishing the fuel centerline melt temperature are discussed in WCAP-12610-P-A, noted above, and implemented by Westinghouse Topical Report WCAP-14483-A, "Generic Methodology for Expanded Core Operating Limits Report," approved by the NRC on January 19, 1999. These methodologies and associated analyses confirm that the present analytical limits for all accidents will be maintained.

Based on this evaluation, it is concluded that the proposed TS change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

ATTACHMENT C

INFORMATION SUPPORTING A FINDING OF NO SIGNIFICANT HAZARDS CONSIDERATION

The proposed TS changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

As required by WCAP-12488-A, the LTA with the four high burnup rods must satisfy the five guidelines accepted by the NRC. These guidelines are as follows.

- Design of LTAs are mechanically and hydraulically compatible with existing fuel
- Peaking factors meet the TS limits
- NRC approved/accepted safety/design methods and codes are used
- No SAFDLs are exceeded
- Not more than eight LTAs per core are inserted

As previously noted, TS 4.2.1 allows the use of a limited number of LTAs in nonlimiting core regions.

The use of high burnup rods or assemblies will comply with WCAP-12488-A and TS. All safety evaluations in support of using high burnup rods or assemblies have been performed in accordance with accepted methodologies.

In support of proposed High Burnup LTA Programs in the industry, the NRC has requested fuel characterization inspections prior to high burnup irradiation. LTA M09E, (i.e., the assembly containing the high burnup fuel rods at Byron Station) was subjected to fuel characterization inspections prior to operation in Byron Station, Unit 2 Cycle 10. These inspections included assembly growth, rod growth, assembly bow, peripheral rod oxidation, grid growth, grid oxidation, guide thimble inner diameter oxidation, grid cell size, crud scraping, single rod exams for the high burnup rods, profilometry, and pellet-to-pellet gap measurements using a Gamma Scanner instrument. All parameters inspected were found to be acceptable.

By performing the above inspection regimen, the demonstrated adherence to the inspection standards and acceptance criteria precludes the potential for new risks to components and systems that could introduce a new type of accident.

Based on this evaluation, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

The proposed TS changes do not involve a significant reduction in a margin of safety.

There is no significant reduction in the margin of safety due to the proposed change. The current TS Safety Limit (SL) 2.1.1.3 states that "In MODES 1 and 2, the peak fuel centerline temperature shall be maintained $\leq$ 4700°F." The TS Safety Limit Bases states that overheating of the fuel is prevented by maintaining the steady state peak Linear Heat Rate (LHR) below the level at which fuel centerline melting occurs. Fuel centerline melting occurs when the local LHR, or power peaking, in a region of fuel is high enough to cause the fuel centerline temperature to reach the fuel melting point.

WCAP-14483-A conservatively states that the fuel centerline temperature limit has been established based on the melting temperature for Uranium Dioxide (UO_2) fuel of 5080°F,

decreasing by 58°F per 10,000 MWD/MTU of burnup. Based on this WCAP-14483-A equation, a burnup of approximately 65,500 MWD/MTU could be accrued before the melting temperature would academically reach the current TS SL of 4700°F.

Westinghouse has evaluated the fuel centerline temperatures for the Byron Station and Braidwood Station reactor cores under uprated power conditions. This evaluation shows that the high burnup rods' temperatures would remain below both the current SL of 4700°F and the proposed WCAP-14483-A equation (i.e., the proposed SL) for fuel melting temperatures under extended burnup conditions past 75,000 MWD/MTU. Thus, fuel melting will not occur in the LTA high burnup rods.

The insertion of the four high burnup rods does not impact any other TS. The LTA has been designed to operate within the SAFDLs and will therefore have sufficient safety margins. Furthermore, the high burnup LTA will satisfy the five guidelines specified in WCAP-12488-A approved by the NRC. The high burnup LTA will comply with TS 4.2.1 by being placed in a nonlimiting core region.

Based on the above discussion, changing the fuel centerline melt temperature from the existing 4700 °F to an equation consistent with the design basis for fuel melt temperature will not significantly reduce the margin of safety. The analysis shown in WCAP-12610-P-A indicates that the minimum margin to safety occurs at fuel assembly Beginning of Life (BOL). The evaluation in WCAP-12610-P-A demonstrates that margin of safety with respect to the proposed SL equation remains sufficient for fuel burnups up to 75,000 MWD/MTU.

Based on this evaluation, the proposed TS changes do not involve a significant reduction in a margin of safety.

Conclusion

Based upon the above analyses and evaluations, we have concluded that the proposed change to the TS involve no significant hazards consideration.

ATTACHMENT D

INFORMATION SUPPORTING AN ENVIRONMENTAL ASSESSMENT

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company (EGC), LLC is requesting changes to Appendix A, Technical Specifications (TS) of Facility Operating License Nos. NPF-72, NPF-77, NPF-37 and NPF-66, for Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2, respectively. The proposed change will revise the Reactor Core Safety Limit on peak fuel centerline temperature from less than or equal to 4700°F (i.e., the current TS limit) to the design basis fuel centerline melt temperature of less than 5080°F, for unirradiated fuel, decreasing by 58°F per 10,000 Megawatt-Days per Metric Tonne Uranium (MWD/MTU) burnup.

During Byron Station, Unit 1 Cycle 10 operation, two Lead Test Assemblies (LTAs) consisting of low tin ZIRLO fuel cladding, fuel pin spring clips, and higher density fuel pellets were utilized consistent with TS 4.2.1, "Fuel Assemblies." For Byron Station, Unit 2 Cycle 10 operation, these LTAs were again utilized; however, one of the LTAs was modified to also include four fuel rods with a beginning of cycle burnup of approximately 45,750 MWD/MTU for the purpose of testing these rods under extended fuel burnup conditions up to approximately 69,000 MWD/MTU.

The current SL of 4700°F was selected as a conservative limit to ensure the fuel centerline melt temperature design basis was satisfied with no consideration given to fuel burnup conditions. At extended fuel burnup conditions, the current SL of 4700°F will become non-conservative with respect to the fuel centerline melt temperature design basis after a burnup of approximately 65,500 MWD/MTU. Therefore, the fuel centerline temperature SL is requested to be modified consistent with the design basis fuel centerline melt temperature limit.

In addition, although there are no TS which impose a limit on fuel rod burnup, Byron and Braidwood Stations have a licensing basis commitment that limits the fuel rod-average burnup to $\leq$ 60,000 MWD/MTU. This licensing basis commitment is documented in the NRC Safety Evaluation supporting Amendments 78 and 70 for Byron and Braidwood Stations respectively, dated December 19, 1995. These amendments approved the use of ZIRLO fuel cladding. Since the four high burnup fuel rods will exceed this licensing basis limit, NRC approval is also requested to increase the current rod-average burnup limit of 60,000 MWD/MTU to approximately 69,000 MWD/MTU for Byron Station, Unit 2 Cycle 10, and up to 75,000 MWD/MTU for future LTA campaigns.

EGC has evaluated this proposed operating license amendment consistent with the criteria for identification of licensing and regulatory actions requiring environmental assessment in accordance with 10 CFR 51.21, "Criteria for and identification of licensing and regulatory actions requiring environmental assessments." Exelon has determined that these proposed changes meet the criteria for a categorical exclusion set forth in paragraph (c)(9) of 10 CFR 51.22, "Criterion for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review," and as such, has determined that no irreversible consequences exist in accordance with paragraph (b) of 10 CFR 50.92, "Issuance of amendment." This determination is based on the fact that this change is being proposed as an amendment to a license issued pursuant to 10 CFR 50, "Domestic Licensing of Production and Utilization Facilities," that changes a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, "Standards for Protection Against Radiation," or that changes an inspection or a surveillance requirement, and the proposed amendment meets the following specific criteria.

ATTACHMENT D

INFORMATION SUPPORTING AN ENVIRONMENTAL ASSESSMENT

(i) The proposed changes involve no significant hazards consideration.

As demonstrated in Attachment C, "Information Supporting a Finding of No Significant Hazards Consideration," the proposed changes do not involve a significant hazards consideration.

(ii) There is no significant change in the types or significant increase in the amounts of any effluent that may be released offsite.

It has been shown in Westinghouse Topical Report, WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," which was approved by the NRC in April 1995, that even though there are variations in core inventories of isotopes due to extended burnup (i.e., up to 75,000 MWD/MTU), there are no significant increases of isotopes that are major contributors to accident doses. In fact, this report indicates that there are reductions in certain isotopes that are major dose contributors under accident situations (e.g., Kr-88). By complying with restrictions on the number and location of LTAs in an operating core, any variation of isotopes would be small. Thus, the 10 CFR 100, "Reactor Site Criteria," limits will not be exceeded.

(iii) There is no significant increase in individual or cumulative occupational radiation exposure.

The proposed changes will not result in changes in the operation or configuration of the facility. There will be no change in the level of controls or methodology used for processing of radioactive effluents or handling of solid radioactive waste, nor will the proposal result in any change in the normal radiation levels within the plant. Therefore, there will be no increase in individual or cumulative occupational radiation exposure resulting from this change.

It is therefore concluded that there will be no significant increase in individual or cumulative occupational radiation exposure resulting from this change.

Conclusion

Based upon the above evaluation, we have concluded that no irreversible consequences exist due to the proposed change.